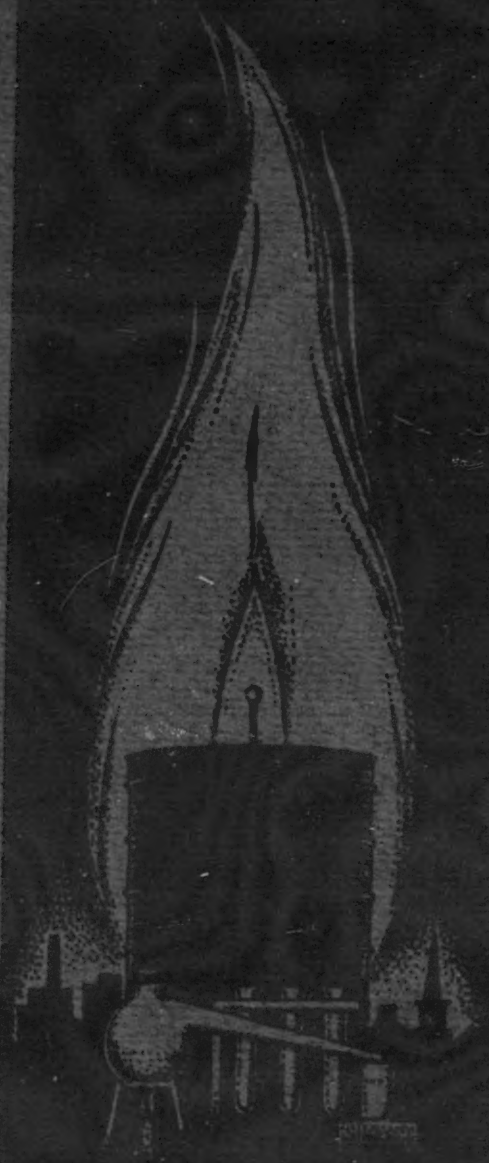

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GAS ABSTRACTS

GAS ABSTRACTS was started in 1945 by the Institute of Gas Technology to survey current technical journals, to select articles pertaining to the Gas Industry, and to prepare abstracts of these articles, stressing their significance to the Gas Industry.

Selection of Articles: Each month the periodicals listed on the last two pages are examined and articles pertaining to the production or manufacture, distribution, transmission or storage, and utilization of natural and manufactured gas and related subjects are selected for abstracting by individual staff members of the Institute of Gas Technology. When possible the significance of the article to the Gas Industry is stressed.

Classification of Abstracts: The abstracts are grouped under twelve headings for presentation and are arranged alphabetically by subject in each group. In this issue a revision has been made in these groupings to conform more closely with Gas Industry practice. The revised headings and the material included are presented below:

1. The Gas Industry will include general information and news items, statistics, business regulations and other articles of general interest.

2. Appliances — Domestic and Commercial will include burners, ranges, cooking equipment, air conditioning equipment, water heaters and other gas appliances for domestic and commercial use.

3. Combustion and Industrial Furnaces will include combustion of gaseous, liquid and solid fuels; design of industrial furnaces; control of furnace atmospheres.

4. Carbonization and Gasification will include manufacture and purification of producer gas, blue gas, carburetted water gas, synthesis gas; carbonization and gasification of coal; and gasification of oil.

5. Natural Gas and Natural Gas Condensates will include production, transmission, distribution and storage of natural gas and natural gas condensates; distribution of LP-gas mixtures; carbon black and chemicals from natural gas and natural gas condensates.

6. Petroleum and Synthetic Liquid Fuels will include production, refining-cracking, alkylation, isomerization, and utilization of petroleum and production of synthetic liquid fuels by the Fischer-Tropsch reaction and hydrogenation.

7. Analytical Methods and Tests will include new and improved methods pertaining to gas making materials, processes, products, and by-products.

8. General and Physical Chemistry will include data on chemical and physical properties of elements and inorganic compounds; new reactions; and methods for carrying out established reactions.

9. Organic Chemistry will include data on organic compounds closely related to the Gas Industry; new reactions; new methods for carrying out established reactions.

10. Chemical Engineering will include data and methods for fluid flow, heat transfer, and unit operations of distillation, evaporation, extractive drying, and filtration.

11. Process Equipment and Instrumentation will include information on new equipment for process operations and process control.

12. Materials of Construction will include new developments in refractories, heat and corrosion resistant materials, new alloys applicable to the Gas Industry, and other materials of construction.

13. New Books will include recent books pertaining to the field of gas technology.

Annual Index: Author and subject indexes will be issued at the end of the year.

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HELIUM INDUSTRY

Mullins, P.V. HELIUM GAS GROWS UP. KANSAS PLANT IS TYPICAL OF THOSE SET UP DURING WARTIME BY THE BUREAU OF MINES. *Oil Weekly* 120, 17-21 *(1946) January* 7.

The future of helium seems likely to be linked with that of light metals. Highlighted by its use in the Navy blimps during the war, this inert gas has been made spectacular by its effectiveness. It is no longer a laboratory curiosity, and the Bureau of Mines can supply large volumes to anyone who has a legitimate use for it. Undoubtedly helium will be utilized more and more as industry becomes familiar with its properties and availability. It has been found that many of the problems encountered in extracting this by-product of natural gas are common to other phases of the petroleum industry. These are discussed in this paper, which is published by permission of the Director of the United States Bureau of Mines.

--Author's Abstract

LP-GAS SALES

Oberfell, G. G. and Thomas, R.W. LIQUEFIED PETROLEUM GAS SALES IN 1945 UP 21.4 PER CENT OVER 1944. *Oil Gas J.* 44, 64-66, 70 *(1946) January 12; LP-Gas* 6, 11-13, 47 *(1946) January.*

The total liquefied-petroleum gas sales in 1945 excluding those for the production of automotive and aviation gasoline, and synthetic rubber components are estimated to be 1,100,000,000 gal., an increase of 21.4% over 1944. The largest single use of liquefied petroleum gas is for household (domestic) purposes, with sales estimated to be 540,000,000 gal., an increase of 23.2% over 1944. The trend is to a greater use of propane in proportion to butane. The increase in industrial uses was largely in the field of motor fuel. Liquefied petroleum gases have been used for peak load shaving and for distribution in pipe lines. The use of liquefied petroleum gases in chemical manufacturing is considerable even with the exclusion of gasoline and synthetic rubber production. New uses for the liquefied petroleum gases include flame cultivation (weed destruction), production of hydrogen by dehydrogenation processes, and precise heating operations.

LP-GAS UTILIZATION

Stryker, A. R. THE UTILIZATION OF LP-GAS BY THE MANUFACTURED GAS INDUSTRY. *Gas Age* 96, 46-49 *(1945) December 13.*

The author draws a picture of the small plant operators' dream, namely, an automatic gas plant in which the most difficult work is to lift a number of hoses to the top of a tank car and connect them (for only one source of fuel or raw material is necessary), where very little labor is required, where there are no by-products to worry about, where no purification is required, where maintenance is negligible, and where there is 100 per cent efficiency in converting raw materials to finished gas. This is the manufactured gas man's dream, and is today a reality in 101 companies in 219 communities scattered throughout thirty-two states.

The article contains a great deal of interesting data and information on the utilization of L P gases by the manufactured gas industry, including complete change-over from manufactured gas to butane or propane air gas, and the problems that may be encountered in appliance adjustment when converting to LP gases.

--L.J. Willien

MEXICAN OIL INDUSTRY

Vinson, C. GREAT PROGRESS RECORDED IN 1945 IN MEXICO'S PROGRAM OF STREAMLINING OIL INDUSTRY. *Oil Gas J.* 44, 197-209 (1945) December 29.

Most notable of the advances made this year is the improvement in refining facilities, as well as the stimulation of the search for new reserves. The country's potential daily production is placed at 145,000 bbl. though the demand is somewhat short of that figure.

--Author's Abstract

NATURAL GAS INDUSTRY

Oberfell, G.G. FUTURE PROSPECTS FOR NATURAL GAS. *Gas* 22, 23-28 (1946) January.

Natural gas and petroleum reserves are larger today than at any other time in our history, despite the fact that recent consumption rates have been at an all-time peak. Furthermore, it is believed that there are more chances of research and development finding entirely new sources of energy or using the available energy in a radically different way than that in which gasoline is now being used, than there is that our petroleum resources will be exhausted within the next 100 years. However, intelligent use of resources is required in order that there may be adequate supplies for use in any national emergency. Research and development work on more efficient conversion and utilization of liquid fuels from petroleum, natural gas, coal, and agricultural products should be continued. The future prospect of the use of natural gas for fuel purposes is very bright. It is expected that as more value is placed upon this commodity and transportation facilities are increased, less natural gas will be used in the present low priced markets. Natural gas as a raw material in the manufacture of chemicals is of considerable economic importance to the chemical industry, but the quantity of natural gas used for producing chemicals is and probably will continue to be relatively small in comparison to the amount used for other purposes. Natural gas is a more economic raw material than coal for conversion to liquid hydrocarbons by the Fischer-Tropsch process. Modifications of the Fischer-Tropsch process, using natural gas, will undoubtedly find useful applications, particularly where the process can be combined with other processes or with existing facilities. The production of natural gasoline and the manufacture of chemicals afford opportunities for such combinations. However, without the economic advantages of such combinations, the available information indicates that as a means of producing gasoline alone the Fischer-Tropsch process would not be competitive with present refinery operations, using crude oil as a raw material, under present prices. Furthermore, the peak of gasoline production from natural gas by the Fischer-Tropsch process will undoubtedly amount to only a minor proportion of the total gasoline supply of the nation. Our appraisal of the commercial possibilities of converting natural gas to liquid fuels, on the basis of our own

research and results reported by other, leads us to be more optimistic than is warranted by any conclusive published data.

--Author's Abstract

RESEARCH, BUREAU OF MINES

Hall, O.D. BUREAU OF MINES GAS RESEARCH PROGRAM. *Gas* 22, 44-45 (1946) *January.*

The proposed program includes studies on natural gas production, transmission and utilization. Specific topics are corrosion; basic data for the conversion of natural gas into chemicals, plastics, drugs and other synthetics; carbon black extraction from natural gas; carbon black from substances other than natural gas; properties of materials at low temperatures; commercial fractionation of natural gas; phase relations and thermodynamic data; production, storage and transportation of liquefied gases; determining liquid hydrocarbon content of natural gases; determining sulfur content of natural gases; economical and practical method of removing hydrogen sulfide from natural gas, thereby utilizing sour natural gases.

SYNTHETIC FUEL PLANTS

SYNTHETIC FUEL PLANTS. *Chem. Eng. News* 23, 2349 (1945) *December 25.*

To save time in carrying out the objectives of the synthetic liquid fuels research and development program, the Bureau of Mines has taken steps to bring to this country several thousand tons of equipment and supplies from captured German and Japanese synthetic fuel plants and laboratories. The Navy Department has volunteered to aid the bureau in obtaining hydrogenation and oil-refining pilot plant units which were found intact at a Japanese naval installation, and requests have been submitted to the War and Commerce Departments for similar assistance in obtaining German equipment for test purposes. Most of Germany's synthetic fuel plants are in the British and Russian zones of occupation, but the equipment desired also is available in those areas occupied by American forces.

2. APPLIANCES -- DOMESTIC AND COMMERCIAL

ADJUSTING APPLIANCES

Rundorff, R.L. CHANGE - OVER METHODS AND PRACTICES IN ADJUSTING APPLIANCES FOR THE UTILIZATION OF HIGHER BTU GAS. *Gas 21, 29-39 (1945) December.*

Various factors involved in correct procedure for changing over from manufactured to natural gas are discussed. Actual mechanics of the change-over are discussed in detail.

--M.F. Knoy

AIR CONDITIONING

THE MODUFLOW CONTROL SYSTEM FOR HOME HEATING AND AIR CONDITIONING. *Gas 22, 35-39 (1946) January.*

The purpose of this study is to present the principles of the Moduflow system of control developed by Minneapolis-Honeywell Regulator Co. Reduced to the parts from which it was coined, Moduflow stands for "modulated flow". Therefore, Moduflow means ... modulated control to provide continuous gentle flow of heat (air, steam, water). Moduflow provides a constant temperature by maintaining a continuous balance between heat delivery and heat loss. The success of the system is its ability to modulate the temperature of a continuous flow of heat rather than to introduce the heat intermittently at a constant volume and a predetermined temperature. This means there will be an even, continuous flow of just the right amount of heat, to replace the heat loss from the home which occurs every second of the day. In thinking of the Moduflow system as applied to the home, it should be pointed out that the system divides itself into two classifications: one a simple application for new and existing homes which requires very few changes from conventional systems ; the other for new homes or homes being remodeled where provision can be made during construction or alterations for certain additional features and refinements.

--Author's Abstract

AIR CONDITIONING, GAS - FIRED

Friend, W.F. GAS AIR CONDITIONING. A SUMMARY OF FIELD EXPERIENCE BROUGHT UP TO DATE. *Gas 21, 52 (1945) December.*

Field experience with year-round gas-fired air conditioning is summarized. First cost and operating costs for domestic and commercial units are stated. Relative amounts of gas required for cooling and for heating are given for various climatic zones. Gas and electric revenues from this equipment are analyzed. The future demand for year-round gas-fired air conditioning promises to be good.

--M.F. Knoy

BURNERS

Corfield, G. and Warren, H.L. DISC GRATE FOR THE TOP SECTION OF THE DOMESTIC GAS RANGE. *Proceedings Pacific Coast Gas Assoc. 36, 58-64 (1945)*

A tentative range top design is described, embodying the use of disc grates, placement of top burners along the back of the range top, elimination of crack, hinges, ridges, holds, and other dirt-catching structures.

2. APPLIANCES -- DOMESTIC AND COMMERCIAL

Test data are set forth showing better utilization efficiency with disc grates than with bar grates. In addition to being easily cleaned and efficient the design submitted offers a maximum of convenient working space.

--M.F. Knoy

DEHUMIDIFIER

DEHUMIDIFYING AND AIR STERILIZATION WITH TRIETHYLENE GLYCOL. *Heating & Ventilating* 43, 78-80 (1946) *January*.

A brief description is given of the operating principles of a triethylene glycol dehumidifier, together with a schematic diagram of the unit. There is a tabulation of dewpoints of room air obtainable with various cooling water temperatures. Relative humidity of the dried air is approximately 25%. Tests are cited to prove the disinfecting properties of the glycol solution.

--M.F. Knoy

WATER HEATERS

Rohde, G.M. GAS WATER HEATER LOAD WITH ELECTRIC LAUNDRY AND DISHWASHING MACHINE. *Gas* 22, 32-34 (1946) *January*.

Every minute that a hot water faucet is kept open, the gas load is increased by 3570 Btu-if that faucet is connected to an automatic gas water heater. Two valuable allies of the gas industry in keeping those faucets open are electrical appliances-the automatic laundry and the automatic dishwasher. In this article, Mr. Rohde brings out a number of ways in which the gas industry and its salesmen' can use these electrical allies to good advantage.

--Editor's Abstract

3. COMBUSTION AND INDUSTRIAL FURNACES

RADIANT HEATING

Andrew, L.W. OBSERVATIONS ON GAS FIRE DESIGN. *Gas World* 123, 425-427 (1945) *November 3.*

The article states that 60-65% is a reasonable theoretical maximum radiant efficiency when using only heat that can be radiated from a gas fire. The average temperature of a fire is 1300° F. (Apparently a gas-fired ceramic structure for use in a fireplace is what is meant as a gas fire).

--R.C. Gardner

RADIANT HEATING

RADIANT HEATING. 46th REPORT OF THE JOINT RESEARCH COMMITTEE OF THE GAS RESEARCH BOARD AND THE UNIVERSITY OF LEEDS. *Gas Times* 45, 37-39 (1945) *December 22.*

The work described in this Report was primarily directed towards a study of the mechanism of heating by radiation, with the particular object of establishing whether the quality (i.e. the distribution of the radiant energy with respect to wave length) of the radiation used was of significance in industrial process in general. This question is of especial importance to the gas industry, (a) because the radiation emitted by most gas heated sources is essentially of longer wave lengths than that from electric tungsten filament lamp units, the difference being largely due to the higher operating temperature of the latter, and (b) because in certain industrial processes, such as the drying of paints by radiant heating, claims have been made that the use of short wave radiation is advantageous. The Introduction (Section III) deals with the basic principles of the utilization of radiant energy for heating purposes and shows the fundamental differences between radiation and convection methods. Section IV describes the infra-red spectrometer used in this work, and the technique of determining emission and absorption characteristics of various industrial materials. Section V gives the results of a preliminary and general survey of the emmission characteristics of typical refractory materials from which the radiating surfaces of high temperature gas heated units are usually made. Section VI gives the results of a study of transmission characteristics of representative stoving enamels. Section VII deals generally with the mechanism of the radiant heating process, with particular reference to its limitations.

--Excerpt from Summary

RADIANT HEATING

FROZEN COAL THAWED BY RADIANT HEAT. *Compressed Air* 50, 323-327 (1945) *December.*

A brief description of radiant heat thawing pits placed beneath railroad tracks for thawing out frozen coal cars prior to unloading. These pits may be either oil or gas-fired and have proven to be effective and economical.

--M.F. Knoy

3. COMBUSTION AND INDUSTRIAL FURNACES

RADIANT HEATING

HEATING AND DRYING BY RADIATION. *Gas World* 123, 140-142 (1945) December 15.

A comparison of the relative merits of electric and gas radiant heaters for paint drying and other industrial uses purports to show that gas-fired radiants are more effective due to the longer wave length of the radiation emitted.

--M.F. Knoy

SPONGE IRON

SPONGE IRON. *Chem. Eng. News* 23, 2364 (1945) December 25.

Sponge iron comparable in quality to that made in the famous ceramic plants at Hoeganaes, Sweden, can be produced by carbon reduction in American common shale brick plants without alteration of the plants, according to the Bureau of Mines. The Swedish sponge iron process involves filling clay refractory containers, called "saggers", with iron ore plus the necessary quantity of solid reducing agent, and then firing in an ordinary ceramic kiln. A characteristic of the Swedish sponge iron is the remarkably low sulfur content, which is obtained by mixing a desulfurizing agent with a solid fuel reducing agent.

THERMAL EFFICIENCY

Thring, M.W. THE EFFECT OF OUTPUT ON THE THERMAL EFFICIENCY OF HEATING APPLIANCES. *J. Inst. Fuel* 19, 12-18, (1945) October.

The performance curves of a fuel fired heating system such as a boiler or metallurgical furnace are calculated by choosing the simplest assumptions. The heat of combustion goes to the charge, to the walls of the heating chamber and to the flue. If a heating system is operated with gradually increasing heat input the efficiency rises from a value of zero at the point where the gases just leave the system at the working temperature, reaches a maximum as the relative effect of wall losses decreases and subsequently falls off as the flue losses rise due to the limited heat transfer coefficient between the gases and the charge. Industrial furnaces (with the exception of certain open-hearth furnaces) are usually operated at a rating below that corresponding to the maximum efficiency. In these cases reduction in size would be likely to increase the efficiency in spite of the loss of heat transfer area, if it could be carried out without refractory difficulties. Boilers usually operate above the rating corresponding to the maximum obtainable efficiency. Their efficiency cannot be greatly affected by lowering the wall losses by better insulation. On the other hand the flue losses are very much greater than the theoretical minimum (which would occur if the gases leave at the steam temperature), hence they can be reduced as well by improving the rate of heat transfer (which can best be done by having more rapid combustion to increase the effective temperature difference) as by reducing the theoretical minimum (reduction of excess air). A basic formula to evaluate factors most likely to increase efficiency and five curves showing results of calculation and their relation to actual data are given.

--L.A. Mekler

3. COMBUSTION AND INDUSTRIAL FURNACES

HEAT TREATING

HEAT TREATING MAGNESIUM CASTINGS. *Gas Age* 96, *20 (1945) December 27.*

The Superior Bearing Bronze Co., of Brooklyn, N.Y. has announced that 10,000 magnesium castings a day for airplane parts, covering a range of sizes from 10 oz. to 150 lbs., have been heat treated in a standard Gehnrich gas-fired industrial oven at 730 to 760°F without a controlled SO_2 atmosphere.

--V.S. De Marchi

FLAME CLEANING

Pfetzing, A.J. FLAME CLEANING OF STEEL - USING GAS. *Gas Age* 96, *13-14 (1945) November 29.*

A method is described of pre-cleaning metal surfaces to be painted, through the use of a gas-air flame. The use of city gas and compressed air for this purpose is said to be more economical than oxy-acetylene, or other oxygen and gas combinations previously used. It is more satisfactory also in that it supplies a more even and less intensive heating. Actual experiences in descaling bridges and other steel structures are set forth.

--M.F. Knoy

4. CARBONIZATION AND GASIFICATION

COAL, OXIDATION

INSTITUTION GAS RESEARCH FELLOWSHIP REPORT 1944-45. THE MECHANISM OF THE OXIDATION OF COAL. *Gas Times* 65, 32-33 (1945) *December 8.*

This Report describes the further development of research initiated in 1943 into the mechanism of the oxidation of coal. The previous Report (1943-44) drew attention to the importance of the part played by peroxidic bodies or active oxygen in the process; this has now been substantiated further by comparative investigations with both coal and carbon, which are shown to behave similarly. The initial reaction appears to involve chemisorption, which, in the presence of water, is followed by the formation of a coal-or carbon-oxygen-water complex. The normal inherent water content of coals is a function of their internal surface; this is a minimum with coals containing c. 89 per cent carbon. The peroxygen content of coals shows a similar variation with carbon content. The peroxygen complex is unstable above approximately 70°C., a temperature long known to be critical in regard to spontaneous combustion of coal. Below it the complex is formed easily and remains relatively stable, little oxygen entering the coal substance; also the amount of ulmification remains very small. The small quantity of gaseous oxidation products consists chiefly of carbon monoxide with a less amount of CO_2. Above 70°C. the complex starts to break down, although with carbon it does not appear to be completely destroyed until 350°C. is reached. Oxidation above 70°C. is also marked by a big increase in the oxygen content of coal, its general ulmification and the yield of gaseous oxidation product; also carbon dioxide then preponderates over the monoxide. These observations were substantiated by means of gravimetric balances for the coal-oxygen reaction at 50°C., at 90°C. The pressure changes at these two temperatures were also different; whereas a gradual fall in pressure was recorded at 50°C., at 90°C. A temporary rise in pressure occurred. The remarkable difference in the behaviour above and below this critical temperature is common to both coal and carbon, and in view of the ability of carbon to form a carbon-oxygen-water complex, it is evident that with both materials the overall oxidation is controlled by the rate of breakdown of the complex. Of paramount importance is the necessity for the presence of water; indeed, an explanation is now forthcoming of the classical experiments of C.J. Baker and H.B. Baker in 1887-88, which demonstrated that dry carbon cannot be readily oxidised even at red heat. The importance of the role of the peroxygen (active oxygen) in the oxidation of coal may be deduced from the experimental work described in this and the previous Report.

--Editor's Abstract

COKE

Cole, A. IMPORTANCE OF COKE TO THE GAS INDUSTRY. *Gas World* 123, 513-518 (1945) *November 24*

The efficiency of the carbonization process is about 80%, which means that about 80% of the Btu input (coal) is realized as potential heat output in gas, coke, benzol, and tar. Nearly half of this output is in coke. However, since the utilization efficiencies of these products are to various extents less than 100%, the average efficiency of utilization of the various products of coal carbonization is about 33%. Although this is not as high as desired by the gas industry, it is, nevertheless, a great deal

higher than the efficiency of utilization of raw coal and the efficiency of utilization of raw coal and the efficiency of generation and utilization of electricity. The fact that coke in boilers only requires about 30-50% excess air for perfect combustion, compared with bituminous coal which requires about 100-200%, is very important. Coke sales, representing about 20-25% of the total revenue of a gas plant, deserve more attention than that seen in the past. In order to increase the sales and the utilization efficiency of coke, it is necessary to develop more efficient coke burning appliances and improve the quality of the coke. These ends are achieved by improved combustion control, proper flue size, fueling at regular intervals, scaling of the grates, etc. A low bulk density coke, about 20 lb. per cu. ft., made in continuous vertical retorts, as compared to 30 lb. per cu. ft. coke made in coke ovens, burns more readily in existing coal grates and is easier ignited. Other factors contributing to quality are the sizing of coke, its moisture and ash content, and its reactivity. Methods of increasing the reactivities of cokes are briefly discussed.

--J.J. Sebastian

GAS, PURIFICATION

Hanson, D.E. and Radford, D.E. THE INACTIVATION OF OXIDE BY GUMS. *Natural Gas Bull.* 9, *19-22 (1945) November - December.*

There is every indication that the strong drop in reactivity of iron oxide when exposed to crude town gas in the purifier boxes is mainly due to the polymerization of liquid phase gums on the internal surface area of the oxide. A high standard of condensing and washing practice should be able to do much to conserve the natural activity of the oxide. This high standard must be strictly adhered to because the occasional flooding of boxes with crude gas, insufficiently stripped of its condensable hydrocarbons, appears to be very harmful. Nevertheless, the data also show that every improvement in condensing and washing operations will be reflected by a sustained higher activity of the oxide. The heating of spent oxide (from which the sulphur has first been removed), air being freely admitted, to a temperature of at least 290°C. and not exceeding 450°C., re-establishes the original activity of the oxide. As far as quantity is concerned, sulphur constitutes the principal "ballast" of spent oxide. It can be removed from spent oxide by means of various extraction or digestion processes, but such sulphur-free spent oxides are generally not much more active than those spent oxides which still contain their sulphur. It can, therefore, be concluded that the presence of elemental sulphur influences the iron oxide activity only to a very minor extent.

--Author's Abstract

HYDROGEN SULFIDE, REMOVAL

Hopton, G.U., and Griffith, R.H. THE REMOVAL OF HYDROGEN SULPHIDE FROM FUEL GASES. *Gas Times* 65, *40-42 (1945) December 8; Gas World* 123, *588-593 (1945) December 15.*

One of the longest established methods of purification of fuel gases is that in which hydrogen sulphide is removed by means of iron oxide. The treatment is highly efficient and concentrations of hydrogen sulphide below 1 part in 10 million can be reached. There still remain, however,

certain features of the process which are difficult to explain, and some disadvantages in ground space requirements and handling charges. For these reasons, the reactions involved have been newly investigated with two objectives; firstly to determine which form of iron oxide is most suitable, and secondly, to attempt to improve the speed of the reaction with a consequent reduction in the size of plant. Two series of tests have been carried out with iron oxide in granular form, one in two steel towers and the other in a box of reinforced concrete. The towers were both 2 ft. in diameter and had a packed space 8 ft. 6 in. high, giving a total oxide volume of 53 cu. ft. Means were provided for feeding pellets to the top of the towers and for withdrawing them from a discharge hopper at the bottom. Coal gas was passed through the towers in series at 4,000 cu. ft. per hr., and removal of H_2S was for a time complete. Not until 380,000 cu. ft. had been treated did the outlet concentration of H_2S reach 1 part per million. The oxide pellets were then moved counter-current to the gas streams by adding fresh material to the top of the second tower, and material discharged from the bottom of this to the top of the first tower, while the oxide from the bottom of the first tower was rejected. The rate of travel of the pellets was adjusted so as to give satisfactory purification of the gas. During this process 800,000 cu. ft. of gas were treated and 28.3 cu. ft. of oxide were rejected; the inlet H_2S averaged 335 gr. per 100 cu. ft., and the outlet 0.6 parts per million. The material withdrawn contained about 20 per cent sulphur, its moisture content remained unchanged. This agrees well with the calculated figure of 21.6 per cent. It is clear that even lower outlet concentrations of H_2S could be obtained by using a deeper bed of material or by increasing the rate of withdrawal. In standard oxide box practice, the treatment of 4,000 cu. ft. of gas per hr. would require 4 boxes, each of 48 sq. ft. cross section and with an effective depth of 16 ft.; the oxide volume would therefore be 768 cu. ft. These results indicate the high reactivity of pelletted oxide. Similar tests are in hand with oxide tablets, made without any binding agent.

--Author's Abstract

METHANE, SYNTHESIS

A. Dent, F.J., Moignard, L.A., Eastwood, A.H., Blackburn, W.H., and Hebden, D. THE SYNTHESIS OF METHANE FROM CARBON MONOXIDE AND HYDROGEN B. Booth, N., Wilkins, E.T., Jolley, L.J. and Tebboth, J.A. CATALYTIC SYNTHESIS OF METHANE. *Gas Times* 66. 29-33 (1946) *January 5.*

The work of the Gas Research Board and of the Fuel Research Station on the synthesis of methane from carbon monoxide and hydrogen are presented and discussed jointly. The 49th Report of the Joint Research Committee was introduced by F.J. Dent who described the work of the Gas Research Board. The work has been concentrated on removal of heat of reaction and has utilized gas recirculation and thin catalyst layers. Nickel promoted with manganese and alumina was employed as catalyst. The work at the Fuel Research station was reported by N. Booth. A liquid jacketed reactor employing Dowtherm has been developed although water has been considered for commercial operation. The catalyst was nickel promoted with thoria and magnesia supported on kieselguhr. Methods of removing sulfur down to the required 0.02 grains per 100 cubic feet have been investigated in

laboratory and in a small plant processing 200 cubic feet of gas per hour. The commercial aspect, effect of unsaturates in the synthesis gas and other factors were discussed by D.T.A. Townend, H.S. Chetham, L.A. Moignard, and L.J. Tolley.

--C.H. Riesz

PROPANE, GASIFICATION

de Jalm, F.W. PRODUCTION OF A GAS MIXTURE FOR SYNTHETIC METHANOL. *U.S. 2,383,715, August 28, 1945.*

A process is described for the catalytic gasification of propane to a mixture of H_2, CO, and CO_2 in which the ultimate ratio of desired H_2 and CO end-products can be accurately adjusted in a water-gas generator following the gasification step.

--P. Lurie

SULFUR RECOVERY FROM SPENT OXIDE

Hanson, E.A., Radford, D.E. and Thomas, O.J. THE PRODUCTION OF SODIUM THIOSULPHATE FROM SPENT OXIDE. *Natural Gas Bull. 9, 29-39 (1945) November-December.*

In this report some investigations have been described on the recovery of sulphur from spent oxide. The sulphur has been converted into thiosulphate. A flow sheet has been designed. A material balance and a balance of costs has also been given. In the latter balance, the cost of one particular raw material, caustic soda, is shown to approach a rather high figure and as research proved that this figure cannot be further reduced by any simple technical means, it is here suggested in order to develop the project along sound lines, to proceed according to one or the other of the following courses: (a) Purchase caustic soda at a reduced cost. (b) Or develop the thiosulphate process in conjunction with other processes of sulphur recovery. Such processes would also require and even produce caustic soda. The following items summarize the work from a fundamental point of view. Elevated temperatures and pressures are necessary in conjunction with turbulent agitation to make the reactions proceed at a reasonable speed. Na_2SO_3 is no intermediate and Na_2S_2 is the starting point of polysulphide oxidation. A quick and accurate method of polysulphide analysis has been devised. The various factors influencing the sulphidization and oxidation have been studied; it is suggested that it is the influence of those factors on the physical condition and chemical constitution of the interfaces between the solid, liquid and gaseous phases which causes the poor reproducibility of the reactions. It is possible to activate the sulphur. Some data have been obtained specifying the different character of turbulent and streamline oxidation. Coke has been found to activate the oxidation to a considerable extent.

--Author's Abstract

4. CARBONIZATION AND GASIFICATION

WATER GAS SETS

Dashiell, P.T. WATER GAS SET CAPACITIES. A REPORT TO THE A.G.A. GAS PRODUCTION RESEARCH COMMITTEE BY THE CHAIRMAN GIVES RESULTS OF TESTS TO DETERMINE PRODUCTION CAPACITY OF WATER GAS SETS. *Am. Gas. Assoc. Monthly* 27, 537-542, 566 (1945) December.

The objectives of the tests were: (1) To find the maximum capacity of the sets obtainable under the conditions as they existed during the summer of 1945. (2) To find what the limitations to production capacity were. (3) To find out what could be done to lift or remove the limitations. (4) The cost of so doing. From the experience of these tests it may be deduced that (1) Up to the point where the coke is blown out of the generator in objectionable quantities, the higher generator blast rate results in increased capacity production. (2) The coke and ash content of the carburetting oil has little effect on the make per running hour, but does have a marked effect on the 24-hour production. (3) Even at the high production rates obtained, the oil cracking surfaces of all sets is sufficient to properly crack the oil necessary to produce a gas of 530 Btu and 0.70 gravity.

--Leon J. Willien

5. NATURAL GAS AND NATURAL GAS CONDENSATES

AMMONIA MANUFACTURE

Lee, J.A. SYNTHETIC AMMONIA PRODUCED FROM NATURAL GAS. *Chem. & Met. Eng.* 52, 94-96 *(1945) December.*

Here for the first time is told the story of the production of synthetic ammonia in one of the new plants in which natural gas is used as the source of the hydrogen. The purification system where the sulphur is removed, the reforming, converting and other operations in the preparation of the synthesis gas will be of particular interest to chemical engineers. The conversion of the synthesis gas to ammonia, and its separation and recovery follow standard practice.

--Editor's Abstract

CARBON BLACK

Loving, W.L. CARBON BLACK. *Petroleum Engineer* 17, 176-182 *(1945) November.*

Here is a brief history of the art of manufacturing carbon pigments and of the development of the channel, thermal, and furnace processes, the principal methods of manufacture in use at the present time. The chief use of carbon black is as a reinforcing agent in rubber compounds. The relationship between the carbon black and natural gas industries is discussed and a justification of the use of natural gas for carbon black manufacture is made in opposition to the frequent charge that the carbon black industry is a wasteful user of a natural resource. Predictions are made concerning probable future of the carbon black industry and the effects that availability of natural rubber may have on the requirement of carbons.

--Author's Abstract

CHEMICALS FROM NATURAL GAS

HUGE PLASTICS-PRODUCTION PROGRAM SEEN; OUTPUT INCREASES 300,000,000 POUNDS. *Oil Gas J.* 44, 79 *(1946) January 12.*

A chart shows the many plastic materials derived from petroleum (or natural gas). A recent development is the production of propionic acid from natural gas at a reasonable cost.

NATURAL GAS DISTRIBUTION

Ralph, H.D. BIG-INCH LINES RECOMMENDED AS NATURAL GAS CARRIERS. *Oil & Gas J.* 44, 45-46 *(1946) January 5.*

An engineering report to the Reconstruction Finance Corp. by Ford, Bacon & Davis, Inc. suggests that it is economically feasible that the big-inch lines could be used to transport natural gas from Texas and Louisiana to the Atlantic seaboard markets for enriching water gas.

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

ALKYLATION

Skinner, E.M. EXPERIENCES IN THE COMMERCIAL APPLICATION OF THE HYDROGEN FLUORIDE ALKYLATION PROCESS. *Trans. Am. Inst. Chem. Engrs.* 41, 647-669 (1945) *December 25.*

Anhydrous hydrogen fluoride appears to be a practical catalyst for alkylation of low molecular weight hydrocarbons to produce components having superior performance characteristics as motor fuels. Extensive operations of commercial HF alkylation plants indicate that the process is very flexible, that most operating variables are not critical as regards optimum performance and that those variables which are critical may be controlled without difficulty.

--Excerpt from Summary

ANTIKNOCK RATINGS

Puckett, A.D. KNOCK RATINGS OF GASOLINE SUBSTITUTES. *J. Research Natl. Bureau of Standards* 35, 273-284 (1945) *October.*

Of interest to the gas industry is the observation of high antiknock ratings for natural gas hydrocarbons (90 and above) and carbon monoxide. The knock ratings of methane and carbon monoxide were found to be well over 100 by three different methods of testing. Other paraffinic and olefinic hydrocarbons were rated high (75 and above). Therefore, in regard to antiknock quality, such gases can be used with supercharge and in high compression engines.

--C.H. Riesz

ASPHALT

Christie, G.R. UTILIZATION, TRENDS, AND FUTURE PROSPECTS OF PETROLEUM ASPHALT -A STATISTICAL REPORT. *Oil & Gas J.* 44, 270-274 (1946) *January 26.*

According to the reports to the Bureau of Mines for the past 5 years, the ten oil refining fields of the United States have produced, and there have been sold, upward of 7,000,000 to 8,000,000 tons of petroleum asphalt each year. Of this total production about 70 per cent has been used annually for paving and the remaining 30 per cent for industrial uses, principally roofing. For the long future, in the road and street maintenance, improvement, and new construction program upon all state, county, and town roads and city streets in the United States, it would be kept in mind that of the 3,215,000 total mileage only approximately 650,000 miles have thus far been improved to the extent of surface treatments or better. Asphalt for water control, erosion control, better railroad ballast, low-cost housing construction and for soil stabilization are all in the picture. To stabilize a single mile to serve as a lowcost base to underlie a highway surface is estimated to require 200 tons of asphalt, and the market would be many tens of thousands of miles. Research work already done has led to a considerable development of asphalt in this field.

--Excerpts from Article

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

ISOMERIZATION

Fawcett, E.W.M. and Narracott, E.S. (to Anglo-Iranian Oil Company Limited, London) ISOMERIZATION PROCESS. *U.S. 2,389,660 November 27, 1945.*

Straight chain paraffins are isomerized under isomerization reaction conditions under superatmospheric temperatures and pressures using aluminum chloride in presence of 0.5-20 weight per cent of hydrogen sulphide.

--M. Miyaji

ISOMERIZATION

Fawcett, E.W.M. and Narracott, E.S. (to Anglo-Iranian Oil Company Limited, London) PROCESSING OF HYDROCARBONS. *U.S. 2,389,659 November 27, 1945.*

In the isomerization of normal paraffins to corresponding branched chain hydrocarbons, the catalytic activity of aluminum chloride with promotional amounts of hydrogen chloride is found to be enhanced by the presence of volatile sulphur compounds such as ethyl mercaptan in the amount of 0.4-5 weight per cent.

--M. Miyaji

ISOPARAFFIN SYNTHESIS

THORIA-ALUMINA CATALYST BEST FOR ISOPARAFFIN SYNTHESIS - ZINC OXIDE IS LESS EFFICIENT, LESS EXPENSIVE. *Oil & Gas J. 44, 86-89 (1946) January 19.*

For the synthesis of isoparaffins from carbon monoxide and hydrogen a catalyst composed of alumina, Al_2O_3, and thoria, ThO_2, in 4:1 weight ratio produced the highest yields. Reaction conditions are: pressure, 4500 psi; temperature, 788-842 °F; space velocity, 500 volumes of synthesis gas per volume of catalyst per hour; carbon monoxide - hydrogen ratio, 1.2 CO to 1.0 H_2. Zinc oxide-alumina gives slightly lower yields but is less expensive to manufacture. Yields obtained with this catalyst are as follows: (grams per cubic meter of synthesis gas): Total yield, C_3 plus 120-130, C_3 20, C_4 (90% isobutane) 50-80, C_5 plus (97% isopentane) 30-60. Catalysts for the synthesis of aromatic hydrocarbons are the oxides of chromium, molybdenum and thorium, combined with 5-10% of potassium carbonate. The yield was only 8-10 grams of liquid per cubic meter of synthesis gas. This product was 50% naphthene. Large amounts of methane were also formed. This work was not investigated further. Iron catalysts were employed for the Fischer-Tropsch process only because of the shortage of cobalt.

--C.H. Riesz

PETROLEUM BY PRODUCTS

Weil, B.H. PETROLEUM BY PRODUCTS. A BIG FACTOR IN ORGANIC CHEMICAL INDUSTRY. *Chem. & Met. Eng. 52, 121-128 (1945) December*

The development is traced of an organic chemical industry based on methane, ethylene, propylene, butylene, butane and pentane as starting materials. The major uses, processes and economic factors are discussed. The present trend seems to be towards cooperative enterprises involving both petroleum and chemical companies for the profitable production of chemicals and specialities.

--C.H. Riesz

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

SHALE RETORTING

Payne, J.W., Lechthaler, C.H., and Bergstrom, E.V. OIL SHALE RETORTING. PRINCIPLE OF TCC PROCESS APPLIED TO DEVELOP CONTINUOUS OPERATION IN WHICH THE SHALE IS HEATED BY COUNTER-CURRENT FLOW OF PRODUCT GAS. *Natl. Petroleum News, Tech. Sect.* 38, R-36-R-39 *(1946) January 2.*

Recognizing that present commercial scale shale retorting operations are cumbersome and costly, the experience gained in the TCC process was used to devedop a method for retorting the shale continuously by gravity flow through a chamber in which the shale is heated by countercurrent flow of the heated product gas. Advantages claimed are reduced retort investment and lower operating and maintenance costs. Operations of a laboratory pilot plant retort are described and data presented on product yields and properties. A 100 ton/day pilot plant has been proposed to the U.S. Bureau of Mines for inclusion in its Synthetic Liquid Fuels program. It is emphasized that, for national security purposes, a commercial scale operation for obtaining oil from shale should be included in development work on this substitute fuel.

--Author's Abstract

TOLUENE, MANUFACTURE

Hartley, F.L. SYNTHESIS OF TOLUENE BY HYDROFORMING AND RECOVERY BY AZEOTROPIC DISTILLATION. *Petroleum Engr.* 17, *156-166 (1945) December.*

A description of the Union Oil Company's hydroforming and toluene recovery at its Oleum refinery. A selected fraction from straight-run and natural gasolines is passed through the hydroformer. The product is stored and at the end of about two weeks, the collected product is repassed to obtain a concentrate containing 38% toluene. This is subjected to fractional distillation to recover a product containing 65% toluene. This is distilled azeotropically with methyl ethyl ketone-water to obtain a crude toluene, which after acid treating and distillation, becomes nitration-grade toluene.

--C.H. Riesz

7. ANALYTICAL METHODS AND TESTS

DISSOLVED GASES, DETERMINATION

Meloche, C.C. and Fredrick, W.G. DETERMINATION OF DISSOLVED GASES IN VOLATILE LIQUIDS. A BOILING-OUT METHOD. *Ind. Eng. Chem., Anal. Ed.* 17, 796-799 *(1945) December.*

Gases dissolved in ether or other volatile substances are removed in a boiling-out procedure. The recovered gases are transferred to a gas buret for measurement and analysis.

--C.H. Riesz

ETHER, DETERMINATION

Meloche, C.C. and Fredrick, W.G. DETERMINATION OF ETHER VAPOR IN GASEOUS MIXTURES. SEPARATION AND DETERMINATION IN GASEOUS MIXTURES CONTAINING ETHYLENE AND DETERMINATION OF DISSOLVED ETHYLENE IN ETHYL ETHER. *Ind. Eng. Chem., Anal. Ed.* 17, 795-6 *(1945) December.*

Ether vapor is absorbed from gases containing ethylene by hydroferrocyanic acid suspended in sulfuric acid (3 volumes concentrated: 2 volumes water). After the reagent has been saturated with other gases in the mixture (e.g. oxygen), it becomes specific for ether vapor.

--C.H. Riesz

FREEZING POINT DETERMINATIONS

Glasgow, A.R., Jr., Anton, J., and Rossini, F.D. DETERMINATION OF THE PURITY OF HYDROCARBONS BY MEASUREMENT OF FREEZING POINTS. *J. Research Natl. Bur. Standards* 35, 355-373 *(1945) November.*

An improved and simplified procedure is described for determining the the freezing points of hydrocarbons from time-temperature freezing and melting curves, and for calculating the purity when the freezing point for zero impurity is (a) known and (b) not previously known. A procedure for determining the cryoscopic constant is also described.

--Author's Abstract

HELIUM GASES, DETERMINATION

Cady, G.H. and Cady, H.P. DETERMINATION OF HELIUM GROUP GASES IN NATURAL GASES AND IN THE ATMOSPHERES. *Ind. Eng. Chem., Anal. Ed.* 17, 760-766 *(1945) December.*

Methods are described for the determination of helium plus neon, argon, and krypton plus xenon by procedures involving fractional distillation, fractional desorption from activated charcoal and absorption of reactive gases by hot calcium. Analysis of 100 ml. of dry air (CO_2 free) showed: 0.023$\overline{2}$ ml He plus Ne; 0.000120 ml Kr plus Xe; and 0.935 ml A. Ten natural gases, rich in nitrogen, were analyzed. None contained a higher proportion of any rare gas, except helium, than is present in air.

--C.H. Riesz

HYDROGEN, DETERMINATION

Hindin, S.G. and Grosse, A.V. LAMP METHOD FOR DETERMINATION OF HYDROGEN IN LIQUID ORGANIC COMPOUNDS. *Ind. Eng. Chem., Anal. Ed.* 17, 767-769 (1945) *December.*

A method is proposed for determining the hydrogen content of liquid organic compounds, especially saturated hydrocarbons. The procedure consists in burning a sample at the end of a cotton wick with dry air and collecting water formed by the combustion with a desiccant ($CaCl_2$ and P_2O_5). Analysis of a series of pure compounds containing 10-16% hydrogen indicated an average accuracy of 0.03% hydrogen and an average precision of 0.02% hydrogen. The method is simple and is especially useful for analyzing volatile liquids. Lower accuracy is obtained with compounds which burn with a smoky flame.

—C.H. Riesz

MANGANESE CARBIDE.

Meyers, W.R. and Fishel, W.P. THE PREPARATION AND HYDROLYSIS OF MANGANESE CARBIDE (Mn_3C). *J. Am. Chem. Soc.* 67, 1962-1964 (1945) November.

Manganese carbide which closely approaches the theoretical composition of Mn_3C has been prepared. Water hydrolysis liberated the combined carbon as gaseous hydrocarbons, chiefly methane and ethane. Acid hydrolysis promotes the formation of free carbon and liquid hydrocarbons.

--F.L. Estes

9. ORGANIC CHEMISTRY

ALKYLATION

Pevere, E.F. (to the Texas Co.,) CONVERSION OF HYDROCARBONS. *U. S. 2,389,739 November 27, 1945.*

A method is provided in alkylating propane and ethylene to higher molecular weight products including isobutane, isopentane and ethyl chloride, in presence of an aluminum chloride complex catalyst and a substantial amount of hydrogen chloride.

—M. Miyaji

ALUMINUM TRIMETHYL, DECOMPOSITION

Yeddanapalli, L.M. and Schubert, C.C. THERMAL AND PHOTOCHEMICAL DECOMPOSITION OF GASEOUS ALUMINUM TRIMETHYL. *J. Chem. Phys.* 14, 1-7 *(1946) January.*

The thermal decomposition of gaseous aluminum trimethyl, in the absence of hydrogen, is nearly 94 percent homogeneous and of kinetic order three-halves over the pressure range 10 to 85 mm measured at room temperature. The reaction products consist largely of methane and to a lesser extent ethane, ethylene, and hydrogen and a solid deposit on the walls of the reaction vessel. A reaction mechanism involving methyl radicals is proposed. The apparent energy of activation, calculated on this basis, is found to be 45 kcal., in agreement with the experimentally determined figure. The high ratio of methane produced to alkyl decomposed suggests that aluminum trimethyl in the vapor state at room temperatures must consist at least of tetrameric molecular complexes. In the presence of hydrogen, both the decomposition rate and the energy of activation are reduced as compared to the decomposition of the pure alkyl, a puzzling effect for which no satisfactory explanation can at present be offered. Photochemically, the presence of hydrogen seems to have little effect on the over-all decomposition but enhances the relative amount of methane slightly. In this, aluminum trimethyl appears to differ from mercury dimethyl which is known to decompose faster thermally and photochemically in the presence of hydrogen than in its absence.

—Author's Abstract

CATALYST

Montgomery, C.W. and Franke, N.W. (to Gulf Research & Development Company). ALUMINUM CHLORIDE CATALYST. *U. S. 2,380,703 July 31, 1945.*

An aluminum chloride catalyst is prepared, having good mechanical strength and reduced tendency to form a sludge. Anhydrous aluminum chloride is heated in a pressure vessel until fusion, under a pressure of hydrogen chloride greater than the vapor pressure of aluminum chloride at the temperature of fusion.

—M. Miyaji

9. ORGANIC CHEMISTRY

CATALYST

Crawford, C.C. and Ross, W.E. (to Shell Development Co.) CATALYSTS. *U. S. 2,379,687 July 5, 1945.*

A fluid aluminum chloride containing catalyst, consisting of a molten mixture of 66% aluminum chloride and 34% pyridine hydrochloride, was found to be efficient in catalytic treatment or conversion of hydrocarbons in the liquid phase.

--M. Miyaji

CATALYST, DEHYDROGENATION

Fulton, S.C. and Kearby, K.K. (Standard Oil Development Company). CATALYTIC DEHYDROGENATION. *U. S. 2,383,643, August 28, 1945.*

An improved catalyst for the dehydrogenation of hydrocarbons is presented. The active ingredient is Fe_2O_3 with MgO acting as carrier. Alkaline fluorides serve as promoters and transition series oxides as stabilizers. A typical composition by weight: MgO–70%; Fe_2O_3–20%; KF–5%; CuO–5%.

--P.C. Lurie

CYCLOPROPANE ISOMERIZATION

Corner, E.S. and Pease, R.N. KINETICS AND MECHANISM OF THE ISOMERIZATION OF CYCLOPROPANE. *J. Am. Chem. Soc.* 67, *2067–2071 (1945) December.*

The rate of homogeneous isomerization of cyclopropane to propylene was studied at 500° C with initial pressures varying from 10 to 910 mm. Additional experiments were made at 20° intervals from 440 to 520° C. at 600 mm. pressure. Addition of hydrogen, ethylene and propylene has little effect on the rate; while in the presence of normal butane, the rate is increased. A mechanism involving primary formation of a trimethylene di-radical is proposed.

--C.H. Riesz

HYDROGENATION

Mozingo, R., Harris, S.A., Wolf, D.E. Hoffhine, C.E., Jr., Easton, N.R., and Folkers, K. HYDROGENATION OF COMPOUNDS CONTAINING DIVALENT SULFUR. *J. Am. Chem. Soc.* 67, *2092–2095 (1945) December.*

Hydrogen was added at carbon to carbon double bonds in thiophene, biotin intermediates and other sulfides in the presence of a supported palladium catalyst either in the presence or absence of a mineral acid. Other unsaturated linkages as well as hydrogenolysis may occur simultaneously.

--C.H. Riesz

METHANOL SYNTHESIS

Ipatieff, V.N. and Monroe, G.S. SYNTHESIS OF METHANOL FROM CARBON DIOXIDE AND HYDROGEN OVER COPPER–ALUMINA CATALYSTS. MECHANISM OF REACTION. *J. Am. Chem. Soc.* 67, *2168–2171 (1945) December.*

Methanol was synthesized from carbon dioxide and hydrogen by means of a copper–alumina catalyst. Copper or alumina alone was inactive. Catalysts containing 8–28% copper were most active, giving conversions of

94% at 410 atmospheres pressure and a catalyst temperature of 285° C. Similar experiments with carbon monoxide and hydrogen gave 39-43% conversion to methanol with as much as 15% of methane and 41% of dimethyl ether being formed as side reactions. A mechanism for the formation of methanol from carbon dioxide and hydrogen under pressure is proposed as follows: Carbon dioxide is hydrogenated to formaldehyde as an intermediate stage; methanol is formed both by direct hydrogenation and by the Cannizzaro reaction.

--C.H. Riesz

PROPANE REACTIONS

Darwent, B. deB. and Steacie, E.W.R. THE MERCURY PHOTOSENSITIZED REACTIONS OF PROPANE AT LOW PRESSURES. *J. Chem. Phys.* 13, 563-571 (1945) December.

The mercury photosensitized reactions of propane were investigated at room temperature between 0.7 and 84.5 mm. Hg. At 84.5 mm. hexane and hydrogen were the chief products. As the pressure was lowered below 18 mm., methane and C_2 and C_4 hydrocarbons were produced in increasing amounts. The nature of reaction is changed in the presence of added hydrogen. Mechanisms of reaction are proposed.

--C.H. Riesz

10. CHEMICAL ENGINEERING

COMPRESSION DISTILLATION

Latham, A. Jr. COMPRESSION DISTILLATION. *Petroleum Refiner* 24, 127-130 (1945) *December.*

Compression distillation depends upon mechanically compressing the steam or other vapor leaving the evaporation compartment of the still. This compression raises the temperature of the steam a few degrees. At the higher pressure, the steam condenses at a temperature somewhat higher than the boiling point of the evaporating raw water, so that heat can flow from the condensing steam to the raw water and boil it. In engineering terms, the condensing vapor is used to supply heat inside the steam chest of the still in place of steam from sources outside the unit. Efficient provision for reducing heat loss to the atmosphere and recovering heat from the distillate and the concentrate carrying out waste as they cool down to room temperature completes the system. No separate condenser or cooling water is needed. The overall fuel economy of the most recent Kleinschmidt compression stills-averaging at least 175 pounds of distillate for each pound of fuel consumed-is believed to be the highest of any self-contained system of evaporation.

--Author's Abstract

EXTRACTIVE DISTILLATION

Dicks, R.S. and Carlson, C.S. EXTRACTIVE DISTILLATION OF HYDROCARBON MIXTURES IN A PACKED COLUMN. *Trans. Am. Inst. Chem. Engrs.* 41, 789-802 (1945) *December 25.*

A comparison of the separations obtained in the same apparatus under conditions of extractive distillation and fractional distillation is reported. Using n-heptane-methylcyclohexane as a test mixture, the separation realized by extractive distillation using aniline as an auxiliary agent was equivalent to a fractional distillation tower four times as tall. The constant-boiling mixture cyclohexane-benzene was separated by extractive distillation yielding nearly pure cyclohexane and benzene. Methylcyclohexane-toluene mixtures were also nearly completely separated. The design of a batch counter-current apparatus suitable for extractive distillation is described.

--Author's Abstract

FLOW IN BURNER STREAMS

Garside, J.E. and Whitehead, A.B. FLOW STATES IN BURNER STREAMS. (I) ETHYLENE STREAMS AT LOW REYNOLDS NUMBERS. *Gas Times* 65, 38-39 (1945 *December 8.*

This paper embodies an account of a preliminary investigation into the flow states of gaseous streams; it forms a continuation of the work described in the Institution Gas Research Feloowship Report, 1942-43. A main purpose of the investigation is a more complete understanding of the mechanism of blow-off of burner flames. It has already been established that aerodynamical factors appear to have no influence in conditioning the dead space between the base of the flame and the head of the burner, an important factor in controlling the light-back of aerated burner flames; dead space is, without doubt, attributable to the thermal gradient ahead of the flame. It is now certain, however, that the

phenomenon of blow-off involves other factors, including flow states and the nature of the diffusion of the inflammable medium concerned into the surrounding atmosphere. The technique of instantaneous shadow photography, which is particularly suited to such an investigation, is being applied in an attempt to relate the flow states in gas streams with flame stability and injector action, in order to assist burner design. The results so far obtained indicate that emergent gas streams behave in a characteristic manner, apparently following laws of flow similar to those governing the flow of confined fluids, and the transition from one type of flow to another appears to be related with the stability of an ignited stream. As yet the work has been confined to one type of orifice and to relatively low rates of flow; it will be extended to cover other factors involved, in order to arrive at a complete analysis of the problem.

--Author's Abstract

FLUID FLOW

Buthod, P. and Whiteley, B.W. PRACTICAL PETROLEUM ENGINEERING. FLUID FLOW. 12. FLOW THROUGH GRANULAR BEDS. *Oil Gas J.* 44, 74-76 *(1946) January 5.*

Charts are presented for calculating the pressure drops attending gas flow through beds of granular material. Curves are based on the recent equations of Oman and Watson in *Natl. Petroleum News, Tech. Sect., Nov. 1, 1944.*

--J.D. Parent

FLUID FLOW

Buthod, P. and Whiteley, B.W. PRACTICAL PETROLEUM ENGINEERING. 11. VERTICAL FLOW OF GASES. *Oil & Gas J.* 44, 305-308 *(1945) December 29.*

Upward and downward flow of gases was treated in the 10th article in this series. In this, the 11th article, plots are provided for the graphical solution of some of these problems.

--J.D. Parent

GAS DIFFUSION

Hogerton, J.F. OAK RIDGE GIVES INDUSTRY A UNIT OPERATION. GAS DIFFUSION. *Chem. & Met. Eng.* 52, 98-101 *(1945) December.*

In ordinary diffusion of gases through a porous membrane or barrier, the rate of passage through the pores is dependent on the square root of the molecular weight. If more than one constituent is present in the gas undergoing processing, there will be a differential rate of passage if the molecular weights of the constitutents are different. Ideally the relative rates of effusion are in proportion to the square roots of the relative molecular weights. Staging adds to the effectiveness of the process. The complex problems encountered in putting this operation on a commercial basis for the separation of the hexafluorides of the uranium isotopes are related. Much original development work in the apparatus field had to be done.

--J.D. Parent

10. CHEMICAL ENGINEERING

GAS FLOW

Honig, R.E. GAS FLOW IN MASS SPECTROMETER. *J. Applied Physics* 16, 646-654 *(1945) November.*

Molecular, rather than hydrodynamic, flow must be obtained if a mass spectrometer is to function properly. Knudsen's equations for molecular flow in cylinders and through circular openings are given. It is stated that the upper limit for molecular flow corresponds to a pressure where the mean free path of the molecules is from 15 to 40 times the diameter of the opening for gas leak. Some practical aspects of design are given.

--J.D. Parent

NATURAL GAS - DIETHYLENE GLYCOL EQUILIBRIA

Russell, G.F., Reid, L.S. and Huntington, R.L. VAPOR--LIQUID EQUILIBRIA BETWEEN NATURAL GAS AND 95 PERCENT DIETHYLENE GLYCOL. *Petroleum Refiner* 24, *137-141 (1945) December.*

This experimental study which is related to the dehydration of natural gas by diethylene glycol was undertaken because of the need for equilibria data in the design and operation of high-pressure absorption plants. In the laboratory a concurrent vapor-liquid contactor was used for the dynamic mixing of natural gas with a glycol-water solution of known composition. The total water and glycol vapor content of the natural gas was determined by sorption in anhydrous magnesium perchlorate, while separately the glycol vapor was absorbed in distilled water. The water-vapor content was calculated by difference. These equilibria data are presented as a ratio of the mol fraction of the component in the vapor phase to the corresponding mol fraction in the liquid solution. Both water and diethylene glycol equilibrium ratios exhibit minimum values at approximately 1500 psi, passing into the retrograde condensation range above this pressure. A rapid decrease in dehydration efficiency at pressures exceeding 2000 psi is indicated.

--Author's Abstract

REFRIGERATION

Zumbro, F.R. and Mitchen, T. LOW TEMPERATURE REFRIGERATION. *Southern Power and Industry* 64, *48-51 (1946) January.*

A discussion of minus 20 F to minus 120 F refrigeration; two and three stage compression; and a low temperature cascade system using ethylene and Freon-22.

--Author's Abstract

THERMAL CONDUCTIVITY, TESTING

Rowley, F.B., Jordan, R.C. and Lander, R.M. THERMAL CONDUCTIVITY OF INSULATING MATERIALS AT LOW MEAN TEMPERATURES. *Refrigerating Eng.* 50, *541-544 (1945) December.*

Test procedure is described for determining the variation in thermal conductivity of various insulating materials at temperatures of 60° to 90° F. The change in conductivity increases from 14.6% for corkboard to 39.6% for glass wool as the temperature is increased over this range.

--M.F. Knoy

THERMAL DIFFUSION

Fox, M.C. THERMAL DIFFUSION AS ADJUNCT OF ELECTROMAGNETIC PROCESS. *Chem. & Met. Eng.* 52, 102-103 (1945) December.

The fundamental principle is briefly explained, and the basic design of the apparatus is related.

--J.D. Parent

II. PROCESS EQUIPMENT AND INSTRUMENTATION

EVAPORATOR

COMPRESSION EVAPORATOR. *Chemical Industries* 57, 1061 (1945) December.

In the Kleinschmidt system it is possible to produce about 175 lbs. of distilled water from sea water per lb. of fuel consumed. The steam leaving the vapor space of the boiler is compressed and sent to the steam chest at a temperature about 9° F. higher than that of the boiling impure water. Provision is made for recovery of heat from the distillate and waste and thereby preheating the feed. Some operating details are given.

—J.D. Parent

GAS RATE RECORDER

Ferguson, H.E. DEMAND METERING INSTRUMENTS. *Am. Gas. Assoc. Monthly* 27, 529-532 (1945) December.

A description is given of an automatic gas rate recorder which can be adapted for use on the various types of gas meters. The recorder was designed by the plant testing department of The Peoples Gas Light and Coke Company of Chicago and is now used by the company. Readings are recorded at 30 minute intervals.

—M.F. Knoy

PELLET DRYER

Payne, J.W. and Lechthaler, C.H. NEW PELLET DRYER FOR TCC CATALYST OFFERS DIVERSE POSTWAR USES. *Chem. & Met. Eng.* 52, 105-107 (1945) December.

Possible applications include: contacting air with adsorbents for dehumidifying or air conditioning, drying grain, dehydrating foodstuffs, drying granular materials of the chemical and related industries, and preheating granular materials for processing at high temperatures. The dryer has the desirable features of simplicity and low construction and maintenance cost, as well as affording continuous intimate contact between the material being processed and the treating gases.

—Excerpts from Article

12. MATERIALS OF CONSTRUCTION

CAST IRON

La Que, F.L. USE OF CAST IRON IN CHEMICAL AND PROCESS INDUSTRIES. *Natl. Petroleum News* 37, 806-810 (1945) October 3.

Cast iron differs from other ferrous materials in the way it resists corrosion due to the presence of graphite flakes, which determines the progress and distribution of corrosion, in a ferritic, pearlitic, or austenitic matrix. Gray alloyed iron is used up to 1200° F. For high temperature service (1500° F.) austenitic cast irons are used, i.e., Ni-resist (20% Ni, or nickel plus copper in the ratio of about 2.5 to 1) and Nicronial (18% Ni, 6% Si, and 2% Cr). The corrosion rates of cast iron pumps and valves handling liquids used by petroleum refiners, and the chemicals handled by high silicon irons are listed.

--V.S. de Marchi

INSULATION

Critchley, G.N., THE CONFERENCE ON THERMAL INSULATION. *J. Inst. Fuel* 20, 19-27 (1945) October.

The economic aspects of insulation are briefly discussed. The effect of porosity and structure on conductivity and diffusivity is also briefly described. It is shown that radiation across pores is very significant at high temperatures, and that insulator conductivity increases as the pore diameter is increased.

--J.D. Parent

13. NEW BOOKS

Hessenbruch, W. METALLE UND LEGIERUNGEN FUR HOHE TEMPERATUREN (METALS AND ALLOYS FOR HIGH TEMPERATURES). *Berlin, Juluis Springer, 1940* (In German). Lithoprinted by *Edward Bros., Inc., Ann Arbor, 1945.*

Jacobson, C.A. (Editor). ENCYCLOPEDIA OF CHEMICAL REACTIONS. VOL. I. ALUMINUM, ANTIMONY, ARSENIC, BARIUM, BERYLLIUM, BISMUTH, BORON, BROMINE. *New York, Reinhold Publishing Corp., 1946.*

Skrabol, A. DIE CHEMISCHE REAKTION. HOMOGEN KINETIK. (CHEMICAL REACTIONS. HOMOGENOUS KINETICS). *Dresden and Leipzig, Theodor Steinkopff, 1941* (In German). Lithoprinted by *Edward Bros., Inc., Ann Arbor, 1945.*

Van Lammeren, J.A. TECHNIK DER TIEFEN TEMPERATUREN. (TECHNIC OF LOW TEMPERATURES). *Berlin, Juluis Springer, 1941 (*In German*).* Lithoprinted by *Edward Bros., Inc., Ann Arbor, 1945.*

The book has chapters on Thermodynamics, Inverse Currents, Air Liquefaction, Liquid Hydrogen, Liquid Helium, Desorption as a Cold-Producing Process, Adiabatic Demagnetization, Kryostate Technic.

Weygand, C. ORGANIC PREPARATIONS. New York, Interscience Publishers, Inc. 1945.

This is a translation of Part II, "Reaktionen" of Conrad, Weygand's Organisch-Chemische Experimentierkunst published in Leipzig in 1938.

Young, C.B.F. and Coons, K.W. SURFACE ACTIVE AGENTS. THEORETICAL ASPECTS AND APPLICATIONS. *Brooklyn, Chemical Publishing Co., Inc., 1945.*

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AMERICAN GAS JOURNAL

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AMERICAN SOCIETY FOR TESTING MATERIALS BULLETIN

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BRAUNKOHLE *(Microfilm)*

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